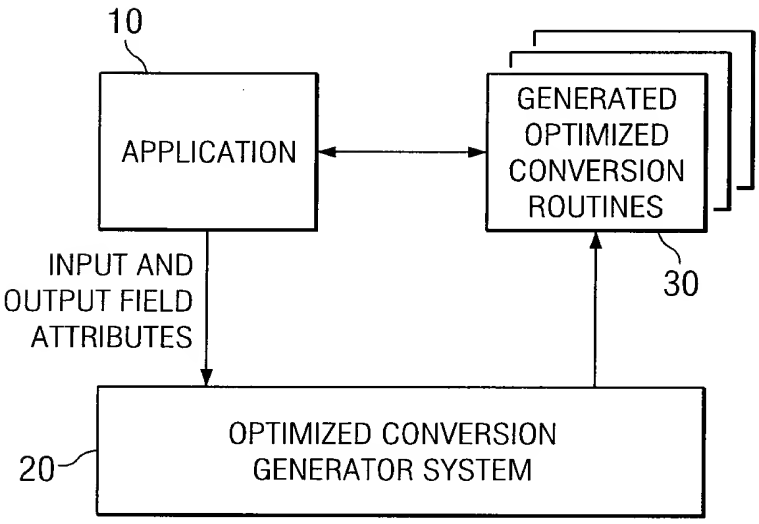

10
APPLICATION
GENERATED OPTIMIZED CONVERSION ROUTINES
30
INPUT AND OUTPUT FIELD ATTRIBUTES
20
OPTIMIZED CONVERSION GENERATOR SYSTEM

FIG. 1

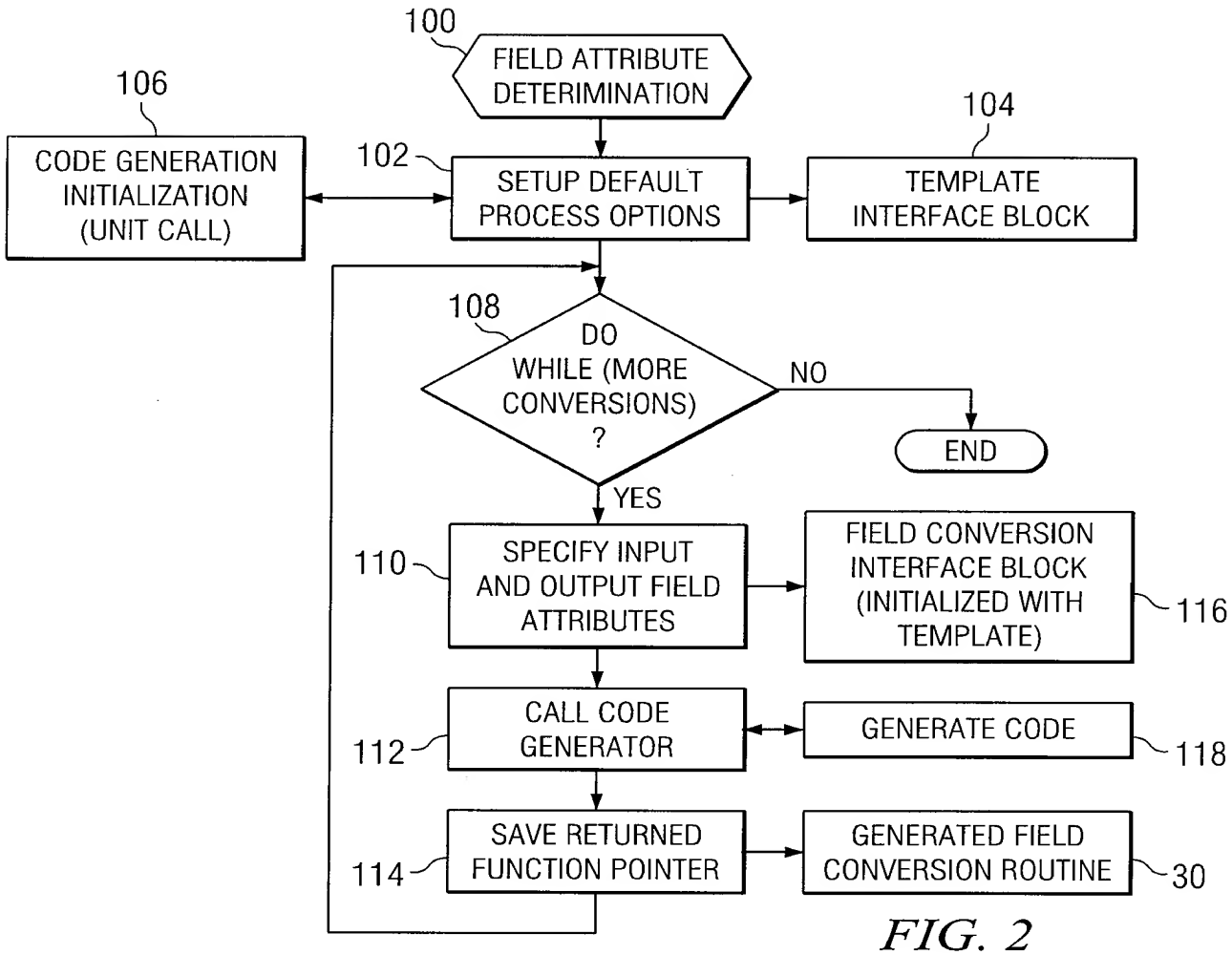

100
FIELD ATTRIBUTE DETERIMINATION
106
CODE GENERATION INITIALIZATION (UNIT CALL)
102
SETUP DEFAULT PROCESS OPTIONS
104
TEMPLATE INTERFACE BLOCK
108
DO WHILE (MORE CONVERSIONS) ?
NO
END
YES
110
SPECIFY INPUT AND OUTPUT FIELD ATTRIBUTES
FIELD CONVERSION INTERFACE BLOCK (INITIALIZED WITH TEMPLATE)
116
112
CALL CODE GENERATOR
GENERATE CODE
118
114
SAVE RETURNED FUNCTION POINTER
GENERATED FIELD CONVERSION ROUTINE
30

FIG. 2

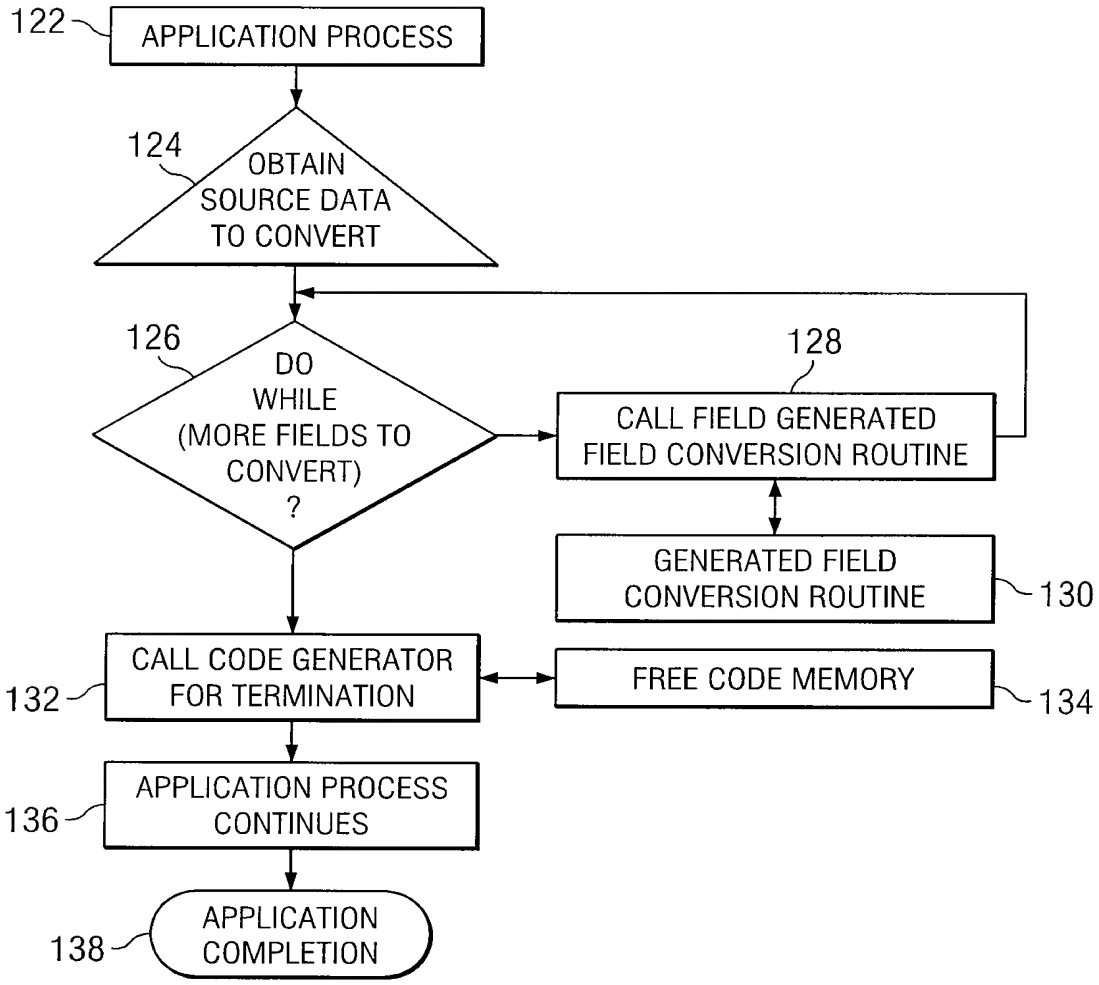

122
APPLICATION PROCESS
124
OBTAIN SOURCE DATA TO CONVERT
126
DO WHILE (MORE FIELDS TO CONVERT) ?
128
CALL FIELD GENERATED FIELD CONVERSION ROUTINE
GENERATED FIELD CONVERSION ROUTINE
130
CALL CODE GENERATOR FOR TERMINATION
132
FREE CODE MEMORY
134
APPLICATION PROCESS CONTINUES
136
APPLICATION COMPLETION
138

FIG. 3

FIG. 4a

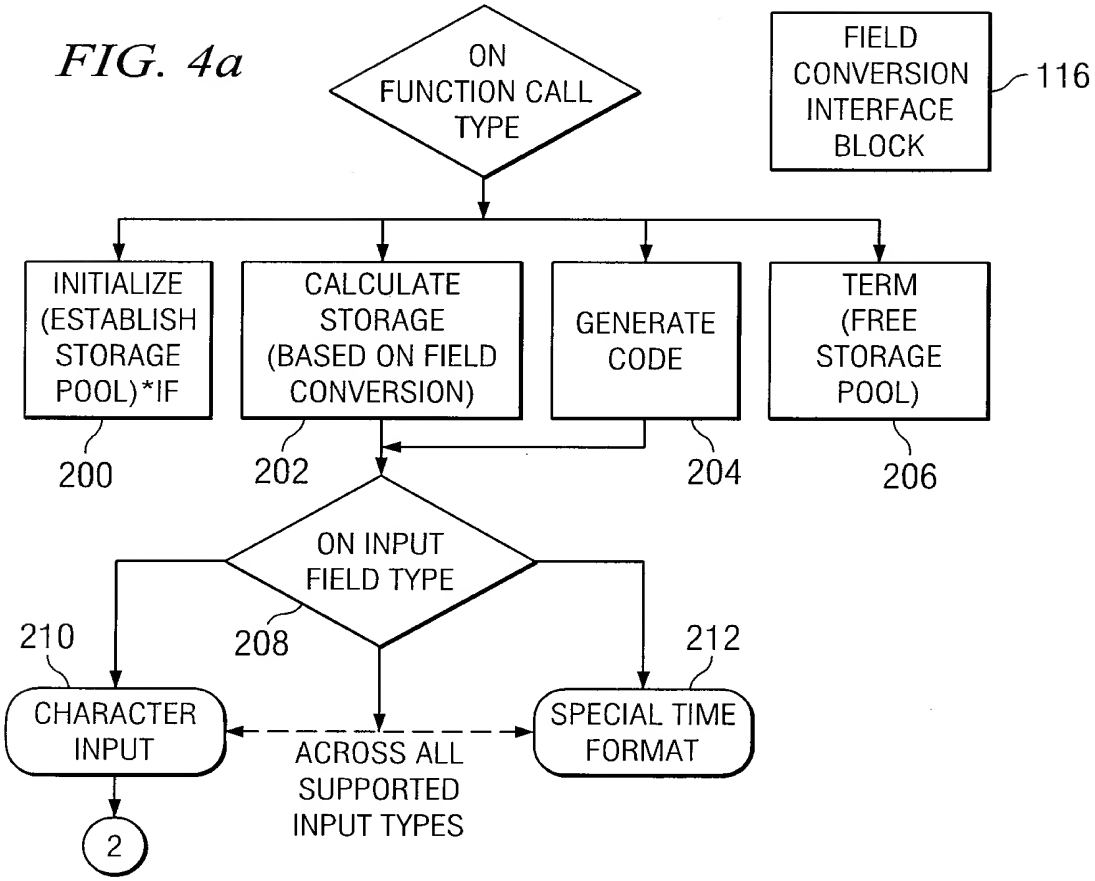
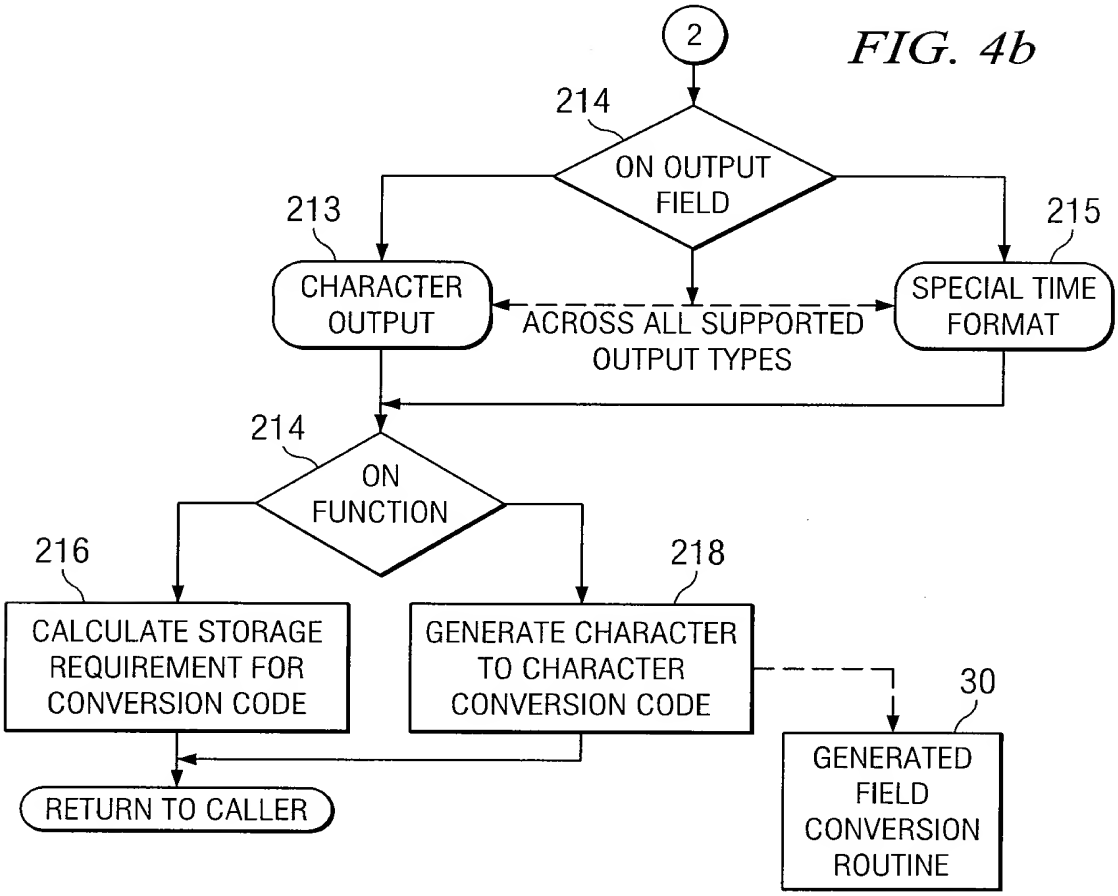

ON FUNCTION CALL TYPE
FIELD CONVERSION INTERFACE BLOCK
116
INITIALIZE (ESTABLISH STORAGE POOL)*IF
CALCULATE STORAGE (BASED ON FIELD CONVERSION)
GENERATE CODE
TERM (FREE STORAGE POOL)
200
202
204
206
ON INPUT FIELD TYPE
208
210
212
CHARACTER INPUT
SPECIAL TIME FORMAT
ACROSS ALL SUPPORTED INPUT TYPES
2

FIG. 4b


2
214
ON OUTPUT FIELD
213
215
CHARACTER OUTPUT
ACROSS ALL SUPPORTED OUTPUT TYPES
SPECIAL TIME FORMAT
214
ON FUNCTION
216
218
CALCULATE STORAGE REQUIREMENT FOR CONVERSION CODE
GENERATE CHARACTER TO CHARACTER CONVERSION CODE
30
RETURN TO CALLER
GENERATED FIELD CONVERSION ROUTINE

```
R5   =  Current Instruction Offset within application buffer
R6   =  Current Instruction Address within application buffer
R7   =  Work Register - used for calculating offsets, etc
R12  =  Base register of code generator and template code

SLR      R5, R5                    clear offset
L        R6, $BCB_BCODE_@          get address of user buffer

* if linkage required call standard linkage builder
IF (TM, $BCB_PFLAG1, $BCB_LINKAGE, O)
  SETF         LINKAGE
  IF (CLI, $BCB_LINKAGE, TYPE, EQ, C'N')
    RESETF    LINKAGE
  COND ELSE
* call standard linkage builder
    #BAS    14, =A (BURST_ENTRY_LINKAGE)
  ENDIF
ELSE
  RESETF      LINKAGE
ENDIF
****
STDRETURN        -        RETURN TO APPLICATION
* $BCB_BCODE_@ WILL POINT TO BUILT CODE
****
*
* Routine to build standard entry linkage
*
BURST_ENTRY_LINKAGE CSMSUBI BASE=R10, WORKREG=R3
*
*  Move Template code into user buffer
        MVC  0 (STD_ENTL_010_L, R6), STD_ENTL_010
*
* Modify "     LA        R14,0(0)"  instruction
*  Get Offset to Savearea using equate STD_ENTL_010_SA_A
*  Set base register for instruction to R12
*  Set D (X,B) of instruction (R7 contains constructed D (X,B) )
        LA      R7, STD_ENTL_010_SA_A (,R5)
        O       R7, =X'0000C000'
        STH     R7,  STD_ENTL_010_SA_T (,R6)
*
```

FIG. 5a

```
*  Modify      " B          0 (R12 ) " instruction
*  Get offset of branch target using equate STD_ENTL_010_B_A_T
*  Set D (X,B) of instruction (R7 contains constructed D (X,B) )
*  ** Note X ( index register ) has been set by assembler as R12
*     STH does not change the instruction's index register
         LA     R7, STD_ENTL_010_B_A_T (,R5) CALC OFFSET FOR BRANCH TARGET
         STH    R7, STD_ENTL_010_B_A_ (,R6)  SET BRANCH D ( X,B )
*
*  Increment Next Instruction Offset  (in R5)  by length of code
*  Increment Next Instruction Address  (in R6)  by length of code
         LA    R5, STD_ENTL_010_L  (,R5)
         LA    R6, STD_ENTL_010_L  (,R6)
*
*  Return to caller
*  Code has been built and the Instruction Offset and Address registers
*  have been updated for next instruction construction

         CSMSUBO
*-  STANDARD ENTRY LINKAGE ----------------------------------------------+
*                                                                         |
*-------------------------------------------------------------------------+
STD_ENTL_010  DS  OS                                                      |
                STM    R14, R12, 12 (R13)                                 |
STD_ENTL_010 _SA_T EQU  *-STD_ENTL_010+2                                  |
              LA       R14, 0 (0)                  BURSTED SAVEAREA+0     |
              ST       R13, 4 (, R14)                                     |
              ST       R14, 8 (, R13)                                     |
              LR       R13, R14                    R13 = BURSTED SAVEAREA |
              LR       R12, R15                    SET BURSTED BASE REG   |
STD_ENTL_010 _B_A  EQU  *-STD_ENTL_010+2                                  |
              B        0 (R12)                     WS_BRANCH              |
STD_ENTL_010 _SA_A  EQU  *-STD_ENTL_010                                   |
              DC       18F' 0 '                                           |
STD_ENTL_010 _B_A_T  EQU  *-STD_ENTL_010                                  |
STD_ENTL_010 _L     EQU  *-STD_ENTL_010                                   |
*-------------------------------------------------------------------------+
```

FIG. 5b

```
* Call made by API passing API $BURSTCB control block
* Control block contains field attributes and conversion
* options

* Reset processing flags
*   NO_BUILD -> doing conversion routine storage calculation
*   CALLED_ROUTINE -> creating a called routine
* Check for API block -> if not there abend with dump
* Copy passed API block to working storage (IN_BCB)

MAIN_0000 DS        OS
*
          RESETF    NO_BUILD
          RESETF    CALLED_ROUTINE
*
          LTR       R1, R1
          BNZ       MAIN_0005
*
          ABEND     001, DUMP
*
MAIN_0005 DS        OS
          MVC       IN_BCB ($BCB_LENGTH), 0 (R1)
*
          LA        R9, IN_BCB                  R9 = ADDRESS OF $BURSTCB
          USING     $BURSTCB, R9
*
* If calculate storage requested SET NO_BUILD
          IF (CLC, $BCB_FUNC, EQ, =Y ($BCB_CALC_STORAGE) )
            SETF      NO_BUILD
          ENDIF

* INITIALIZE WORKING STORAGE
*  If actually BUILDING code (not NO_BUILD)
*    1. Obtain offset from beginning of BASE REGISTER
*     for code. If callable routine this has been set to 0.
*     otherwise this we are building inline code within the application's
*     user managed buffer and the offset will set to current instruction offset
*     within the buffer.
*       2. Obtain address of passed code buffer
*       3. Calculate current instruction address based on offset into buffer
```

FIG. 6a

FIG. 6b

```
MAIN_STRT DS      OS
          IF (-NO_BUILD)
          LH      R5, $BCB_BCODE_OFFSET
          L       R6, $BCB_BCODE_@
          LA      R6, 0 (R5, R6)
        ELSE
          SLR     R5, R5                    CLEAR FOR ACCUM
          SLR     R6, R6                    CLEAR FOR ACCUM
        ENDIF
*
* INITIALIZE WORK FIELDS FOR ANY COLUMN CONVERSION
* 1. Obtain input field's addressing register
* 2. Build RX type assembler instruction D (X,B) with offset 0
* 3. Obtain output field's addressing register
* 4. Build RX type assembler instruction D (X,B) with offset 0
*    set template for output D (X,B)
* 5. Obtain input and output lengths
* 6. Set Current working D (X,B) templates
          SLR     R7, R7
          ICM     R7, B'0001', $BCB_IREG
          SLL     R7, 4                     SHIFT NIBBLE
          STC     R7, WB_INIT_SOURCE_DB
          ICM     R7, B'0001', $BCB_OREG
          SLL     R7, 4                     SHIFT NIBBLE
          STC     R7, WB_INIT_TARGET_DB
          MVC     WB_TOT_INPUT_LEN_$BCB_ILEN
          MVC     WB_TOT_OUTPUT_LEN_$BCB_OLEN
          MVC     WB_SOURCE_DB, WB_INIT_SOURCE_DB   RESET DB
          MVC     WB_TARGET_DB, WB_INIT_TARGET_DB   RESET DB
*
*   CHECK FOR LINKAGE REQUIREMENTS
*   IF LINKAGE = E (BASIC ENTRY - SAVE/ RESTORE  R14) THEN
*      BURST_WORK_BRANCH WILL SAVE R14 AND SET RESTORE_R14
*      BURST_EXIT_LINKAGE RESTORES R14 AND BASR R14
*    ENDIF
            RESETF  RESTORE_R14
            IF (TM, $BCB_PFLAG1, $BCB_LINKAGE, O)
              SETF      LINKAGE
              IF  (CLI, $BCB_LINKAGE_TYPE, EQ, C'N')
                RESETF   LINKAGE
              COND ELSE
                #BAS   14,=A (BURST_ENTRY_LINKAGE)
                ENDIF
            ELSE
                RESETF   LINKAGE
            ENDIF
```

FIG. 6c

```
*  CALL INPUT TYPE PROCESSING ROUTINE
*  1.  Get address of input field type table
*      This table contains an index of supported input types
*      with their associated code generation routines
*  2.  Call code generation routine for Input field type
*       In this case INPUT FIELD TYPE IS CHARACTER
*       INPUT FIELD TYPE CHARACTER calls routine named CHARACTER
****  Further down subroutine CHARACTER is shown
            L       R14,=A (TYPE_TABLE)
            LH      R15, $BCB_ITYPE
            LA      R15, 0 (R14, R15)
            L       R15, 0 (,R15)
            BASR    R14, R15
*  Subroutine has built conversion code for INPUT TYPE CHARACTER and OUTPUT TYPE CHARACTER
*  Check for other process options such as: accumulate a source addressing register,
*  accumulate a target addressing register, or accumulate alternate register.
*  alternate register usually is a total output length accumulator used by the calling
*  application to keep track of an aggregate of all output field lengths
*  1. IF source addressing register accumulate requested build code to accumulate
*  2. IF target addressing register accumulate requested build code to accumulate
*  3. IF length register accumulate requested build code to accumulate
*  4. IF exit linkage requested build exit linkage
*  5. RETURN TO API CALLER with generated conversion routine
MAIN_0200 DS      0S
            IF (TM, $BCB_PFLAG1, $BCB_SRC_ACUM, 0)
              LH        R0, WB_SOURCE_ACCUM_INDEX
              IC        R1, $BCB_SRC_ACUM_REG
              LH        R7, WB_TOT_INPUT_LEN
              #BAS      14, =A (FIXED_ACCUM)
            ENDIF
*
            IF (TM, $BCB_PFLAG1, $BCB_TRG_ACUM, 0)
              LH        R0, WB_TARGET_ACCUM_INDEX
              IC        R1, $BCB_TRG_ACUM_REG
              LH        R7, WB_TOT_OUTPUT_LEN
              #BAS      14, =A (FIXED_ACCUM)
            ENDIF
*
            IF (TM, $BCB_PFLAG1, $BCB_TRG_L_ACUM, 0)
              LH        R0, WB_TARGET_ACCUM_INDEX
              IC        R1, $BCB_TLN_ACUM_REG
              LH        R7, WB_TOT_OUTPUT_LEN
              #BAS      14, =A (FIXED_ACCUM)
            ENDIF
*
*  BURST EXIT LINKAGE
            IF (LINKAGE)
              SETF      CLEAR_R15
              #BAS      14, =A (BURST_EXIT_LINKAGE)
            ENDIF
            RETURN to CALLER
```

FIG. 6d

```
*-------------------------------------------------------------*
*  Character Input Field Type Conversion Routine              *
*  Abstract:                                                  *
*     This routine is called to either build Character Input  *
*     Fields to all supported Output Field Types, or to calculate *
*     storage requirements for generated conversion routines for *
*     Input field type Character                              *
*                                                             *
*  CHARACTER field type constraints                           *
*     These field types will be of fixed length               *
*     Maximum length is 254 8bit bytes                        *
*     They may be proceeded with a null field indicator of length *
*        1 byte that will contain values of x'00' for non-null fields *
*        and x'ff' for nulled fields.  Nulled fields will not be *
*        converted accept to indicate on output that field was null *
*     There values are of EBCDIC CCSID  (character code set)  unless *
*     a CCSID is specified through the API.                   *
*                                                             *
*-------------------------------------------------------------*

CHARACTER CSMSUBI BASE=R10, WORKREG=R3
*     Use branch table generated by API to branch on output type (BTYPE=0)
*     Example is demonstrating character to character conversion
*     Branch will be taken to CHAR_CHAR_0000
          L          R15, =A (RC_32)
          $BURST     BTABLE                                  X
                     BREG=1,                                 X
                     BTYPE=0,                                X
                     UNSUPPORTED=0 (,R15),                   X
                     CHAR=CHAR_CHAR_0000,                    X
                     LVARC=CHAR_VARC_0000,                   X
                     VARC=CHAR_VARC_0000
*-@PSEUDO-CODE@-----------------------------------------
*                    CHARACTER TO CHARACTER CONVERSION
*
*  - DETERMINE WORKING STORAGE
*     Some conversions require the generation of local working storage
*     Working storage is generated according to specific conversion options and
*     specific input and output field attributes to avoid generating more storage
*     than needed
*
*     IF CONVERTING CCSID'S (Character code sets) THEN
*       IF using a character translation table (uses TR instruction)
*         Build BRANCH over working storage
*         Build FULL WORD to hold Address character translation table
*         UPDATE Previously built Branch instruction to branch to current offset
*             (offset is next halfword aligned byte where next instruction is to be built)
*       ENDIF
*     ENDIF
*
```

FIG. 6e

```
*  IF INPUT LENGTH is GREATER than OUTPUT LENGTH
*     current implementation allows for truncation of trailing spaces
*     If input field being converted by generated code contains non-spaces
*       that won't fit into output field of lesser length then conversion
*       error 4 routine will be called to return a value of 4 in R15
*
*     1. Build BRANCH over working storage
*     2. Build a buffer full of spaces to be used in INPUT field compare
*     3. Build Conversion error routine to return error #4
*     4. UPDATE Previously built Branch instruction to branch to current offset
*          (offset is next halfword aligned byte where next instruction is to be built)
*  ENDIF
* - DETERMINE WORKING STORAGE
*
*-@PSEUDO-CODE@------------------------------CHAR_CHAR_0000 DS OS
*
*  BURST WORKAREA IF CONVERSION ERROR OR CONVERT CCSID
              TM      $BCB_PFLAG2, $BCB_CCSID_CNV
              BNZ     CHAR_CHAR_0020
              CLC     $BCB_ILEN, $BCB_OLEN
              BNH     CHAR_CHAR_0040
*
CHAR_CHAR_0020 DS OS
              #BAS    14, =A (BURST_WORK_BRANCH)
*
              IF (TM, $BCB_PFLAG2, $BCB_CCSID_CNV, NZ)
                IF (TM, $BCB_PFLAG2, $BCB_CCSID_CNV_ATOE, O)
                  #BAS    14, =A(BURST_BWK_TO_E_XLATE_@)
                ELSE
                  #BAS    14, =A(BURST_BWK_TO_O_XLATE_@)
                ENDIF
                #BAS    14, =A(BURST_BWK_FULL)
                STH     R7, WB_SAVE_R2_OFFSET
              ENDIF
*
*  IF ILEN > OLEN THEN NEED FOLLOWING WORK FIELDS
*     BURST  BUFFER255 - SPACES
*     BURST  #@ERROR4 CALL
*  ENDIF
            IF (CLC, $BCB_ILEN, GT, $BCB_OLEN)
              #BAS    14, =A(BURST_BWK_BUFFER255)
*
*
              LA      R1, 4                                  #@ERROR4
              #BAS    14, =A (BUILD_CNVERR)
          ENDIF
*
          #BAS     14, =A (UPDATE_WORK_BRANCH)
*
*
```

FIG. 6f

```
*  IF OUTPUT NULLABLE THEN
*     BURST MOVEMENT OF NUL INDICATOR
*     R1 = X'00' FOR MVI Instruction Builder
*     WB_TARGET_DB (current target D(B) ) USED FOR INDICATOR LOCATION
*     Build MVI OF NULL INDICATOR (MVI_0000)
*     UPDATE Current TARGET D (B) TO ALLOW DATA TO SKIP NULL INDICATOR
*     ADD 1 TO TOT OUTPUT LENGTH (FOR NULL INDC)  (this allows for accumulation requests)
*  ENDIF
CHAR_CHAR_0040 DS 0S
               IF  (TM, $BCB_OFLAG1, $BCB_ONULL, O)
                  SLR      R1, R1                      CLEAR SOURCE BYTE
                  #BAS     14, =A (MVI_0000)           BURST MVI NULL INDC
*
                  LH       R1, WB_TARGET_DB            UPDATE TARGET DB
                  LA       R1, 1 (, R1)
                  STH      R1, WB_TARGET_DB
*
                  LH       R1, WB_TOT_OUTPUT_LEN       UPDATE OUTPUT LEN
                  LA       R1, 1 (, R1)
                  STH      R1, WB_TOT_OUTPUT_LEN
               ENDIF
*
*  IF input length < then output length
*     call routine to build code to pad output field with spaces
*  ELSE
*     IF input length = Output length
*       Call routine to build an MVC instruction
*           This routine uses current source and target D (B) 's
*              and the output length to construct the instruction
*  ELSE
*      input length > output length
*      Call routine to build an MVC instruction
*           This routine call will use the input length (since it shorter)
*           (source and target D (B)'s will be used
*      Build Code to check for truncation of only spaces
*  ENDIF
*  ENDIF
                  LH       R1, $BCB_ILEN               GET INPUT LEN
                  LH       R2, $BCB_OLEN               GET OUTPUT LEN
*
                  CR       R1, R2                      CHECK LENGTHS
                  BE       CHAR_CHAR_0050                 EQUAL
                  BH       CHAR_CHAR_0100                 I > O ->
*
*  INPUT LENGTH LESS THAN OUTPUT -> NEED TO PAD
*  Build Character padding code
          #BAS   14, =A (SSP_0000)
*
* Build code TO MOVE CHARACTER FIELD TO CHARACTER FIELD
CHAR_CHAR_0050 DS     0S
          #BAS   14, =A (MVC_0000)                    BURST MVC INSTRUCTION
            B      CHAR_CHAR_0200
```

```
*  INPUT field is too large to fit
*  Build code TO MOVE CHARACTER FIELD TO CHARACTER FIELD using input field's length
CHAR_CHAR_0100  DS     0S
                LR      R1, R2
                #BAS    14,=A(MVC_00000)                BURST MVC INSTRUCTION
*
*  MOVE CHECK FOR SPACES
*  IF TRUNCATED DATA NOT SPACES THEN #@ERROR4

                IF  (-NO_BUILD)
*
                MVC     0(CHAR_CHAR_010_L, R6), CHAR_CHAR_010
*
*  SET LENGTH OF COMPARE
                LH      R7, $BCB_ILEN
                SR      R7, R1
                BCTR    R7, 0
                STC     R7, CHAR_CHAR_010_OLEN_A (,R6)
*
*  SET SOURCE DB TO SOURCE + OLEN-1
                LH      R7, WB_SOURCE_DB
                LA      R7, 0 (R1, R7)
                BCTR    R7, 0
                STH     R7, CHAR_CHAR_010_SDBN_A (,R6)
*
*  UPDATE BUFFER OFFSET
                LH      R7, WB_BUFFER255_OFFSET
                O       R7, =X'0000C000'
                STH     R7, CHAR_CHAR_010_B255_A (,R6)
*
*  UPDATE #@ERROR4  BRANCH
                LH      R7, WB_CNVERR4_OFFSET
                STH     R7, CHAR_CHAR_010_BERR_A (,R6)
*
                ENDIF                           (NO_BUILD)
*
                LA      R5, CHAR_CHAR_010_L (,R5)
                LA      R6, CHAR_CHAR_010_L (,R6)
*
```

FIG. 6g

```
*  CHECK FOR TRANSLATION of CCSID's
*  If translation requested call translation routine generator
*    *** note translation routine will perform accumulation
*        operation if API requested it.  If accumulation is performed
*        by the routine the IN_BCB (copy of API block used by generator)
*        will be updated to turn off accumulation by the main process
*        done upon CHARACTER subroutine (see above)
CHAR_CHAR_0200 DS     0S
                  IF (TM, $BCB_PFLAG2, $BCB_CCSID_CNV, NZ)
*                    IF IREG =2 AND SRC_ACCUM TR INST WILL BUMP REG
                     SETF    SAVE_R2
                     IF (CLC, $BCB_IREG, EQ, =H'2') , AND,                    X
                    (TM, $BCB_PFLAG1, $BCB_TRG_ACUM+$BCB_TRG_L_ACUM, NZ)
                         RESETF SAVE_R2
                         NI         $BCB_PFLAG1, X'FF'-$BCB_SRC_ACUM
                     ENDIF
                     RESETF XLATE_TO_E
                     IF (TM, $BCB_PFLAG2, $BCB_CCSID_CNV_ATOE, O)
                       SETF XLATE_TO_E
                     ENDIF
                     #BAS    14, =A (DO_XTAB_SHORT)
                  ENDIF
*
CHAR_9999 DS     0S
             B      CHARACTER_END
*-------------------------------------------------------------------------------------------|
*  BURST CHARACTER TO CHARACTER ILEN > OLEN                                                  |
*  TEMPLATE CODE USED FOR NON-SPACE TRUNCATION                                               |
*-------------------------------------------------------------------------------------------|
CHAR_CHAR_010 DS 0S                                                                         |
CHAR_CHAR_010_OLEN_A EQU *-CHAR_CHAR_010+1     LEN OF CLC                                   |
CHAR_CHAR_010_SDBN_A EQU *-CHAR_CHAR_010+2     LOC OF SOURCE TO COMP                        |
CHAR_CHAR_010_B255_A EQU  *-CHAR_CHAR_010+4    LOC OF 255 SPACES                            |
               CLC      0 (0, 0) , 0 (0)       SDB+ (OLEN-1), BWK_BUFF255                |
CHAR_CHAR_010_BERR_A EQU *-CHAR_CHAR_010+2                                                  |
               BNE      0 (R12)                NOT SPACES?  -> #@ERROR4                  |
CHAR_CHAR_010_L    EQU *-CHAR_CHAR_010                                                      |
*-------------------------------------------------------------------------------------------|
```

FIG. 6h